CHE-05

ASSIGNMENT BOOKLET

Bachelor's Degree Programme (B.Sc.)

ORGANIC CHEMISTRY

It is Compulsory to submit the Assignment before filling in the Term-End Examination Form.

(Valid from 1st January, 2022 to 31st December, 2022)

Please Note

- You can take electives (56 to 64 credits) from a minimum of TWO and a maximum of FOUR science disciplines, viz. Physics, Chemistry, Life Sciences and Mathematics.
- You can opt for elective courses worth a MINIMUM OF 8 CREDITS and a MAXIMUM OF 48 CREDITS from any of these four disciplines.
- At least 25% of the total credits that you register for in the elective courses from Life Sciences, Chemistry and Physics disciplines must be from the laboratory courses. For example, if you opt for a total of 64 credits of electives in these 3 disciplines, at least 16 credits should be from lab courses.
- You cannot appear in the Term-End Examination of any course without registering for the course. Otherwise, your result will not be declared and the onus will be on you.

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School of Sciences
Indira Gandhi National Open University
New Delhi
(2022)

Dear Student,

We hope, you are familiar with the system of evaluation to be followed for the Bachelor's Degree Programme. At this stage you may probably like to re-read the section on assignments in the Programme Guide that we sent you after your enrolment. A weightage of 30 percent, as you are aware, has been earmarked for continuous evaluation, which would consist of one tutor-marked assignment. The assignment is based on Blocks 1, 2, 3 and 4.

Instructions for Formatting Your Assignments

Before attempting the assignments, please read the following instructions carefully.

1. On top of the first page of your answer sheet, please write the details exactly in the following format:

ENROLMENT NO.:…..……..……

NAME:……..……

ADDRESS:…….....……

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COURSE CODE : ….....……

COURSE TITLE : ….....……

ASSIGNMENT NO.: ….....……

STUDY CENTRE : ….....…… DATE:..…….
(NAME AND CODE)

PLEASE FOLLOW THE ABOVE FORMAT STRICTLY TO FACILITATE EVALUATION AND TO AVOID DELAY.

2. Use only foolscap size writing paper (but not of very thin variety) for writing your answers.

3. Leave 4 cm margin on the left, top and bottom of your answer sheet.

4. Your answers should be precise.

5. While writing answers, clearly indicate the Question No. and part of the question being solved.

6. Please note that:

   i) The Assignment is valid from 1st January, 2022 to 31st December, 2022.

   ii) The response to this assignment is to be submitted to the Study Centre Coordinator within eight weeks of the receipt of this booklet in order to get the feedback and comments on the evaluated assignment.

   iii) In any case, you have to submit the assignment response before filling the exam for the term end examination.

7. We strongly suggest that you should retain a copy of your assignment responses.

   Wishing you all good luck.

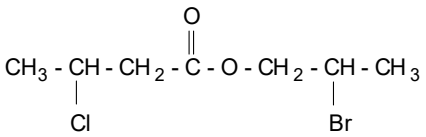
Tutor Marked Assignment
CHE-05: ORGANIC CHEMISTRY

Course Code: CHE-05
Assignment Code: CHE-04/TMA/2022
Maximum Marks: 100

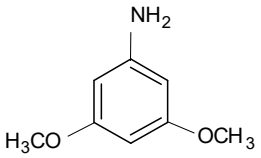
Note: Answer all the questions given below. The marks are indicated in the brackets.

1. (a) Give the IUPAC names of the following compounds: (2)

(i)



(ii)

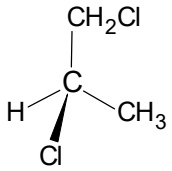


(b) Explain the terms bond energy and bond dissociation energy giving suitable examples. (3)

2. (a) Explain the *cis*- and *trans*- forms of 1,3-cyclobutanedicarboxylic acid. Which one of these two will have dipole moment? Explain. (3)

(b) Write the enantiomers of 3-methyl-1-pentene. (2)

3. (a) Assign *R* or *S* configuration to the following compound giving the steps involved. (2)



(b) What are resolving agents? Give one example each for an acidic and a basic naturally occurring resolving agent. (3)

4. (a) Arrange the following compounds in the increasing order of their solubility: (2)

Butanol, Ethanol, Hexanol

Also give reason in support of your answer.

(b) What kind of changes occur in the molecule when it absorbs the following radiation? (3)

(i) UV (ii) IR (iii) Radio waves

5. (a) Arrange the following compounds in the increasing order of their acidity: ($2\frac{1}{2}$)

CH_3COOH, $(CH_3)_3C\text{-}OH$, CH_3CH_2OH, $CHCl_3$

Also give reason in support of your answer.

(b) Write the resonance structures of acetone molecule. Which one of them is the most important one and why? ($2\frac{1}{2}$)

6. (a) How would you prepare alkanes from the following: (Give only one example) (3)

(i) An alkyl halide
(ii) A carboxylic acid
(iii) An alkene

(b) Explain the following: (2)

(i) In the mass spectra, alkanes give a series of peaks separated by 14 mass units.

(ii) Alkanes with odd number of carbon atoms have lower melting points than those with even number of carbon atoms

7. (a) Explain the following in one or two sentences. (3)

(i) Alkenes are more soluble in water the corresponding alkanes.

(ii) Addition reactions of alkenes are exothermic processes.

(iii) Hydroboration appear as anti-Markownikoff's addition

(b) An alkene having molecular formula C_6H_{12} on ozonolysis yielded butanal and ethanal. What is the structural formula of alkene? (2)

8. (a) An alkyne is more acidic than an alkane. Explain. (2)

(b) How would you prepare the following? (3)

(i) 3-Octyne from 1-hexyne

(ii) 1,2-Dibromoethene from ethyne

(iii) Ethanal from ethyne

9. (a) Write all the possible resonance structures of cation formed from *ortho* nitration of nitrobenzene. (2)

(b) What do you understand by *ortho*-directing activators, *para*- directing deactivators and *meta*-directing deactivators? (3)

10. (a) Explain why 1-position in naphthalene is more reactive than the 2-position towards electrophelic substitution. Draw all possible resonance structures. (2)

(b) Predict the products of the following reactions: (3)

(i) Oxidation of propylbenzene

(ii) Friedel-Crafts acylation of pyrrole

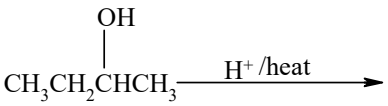
(iii) Friedel-Crafts alkylation of pyridine

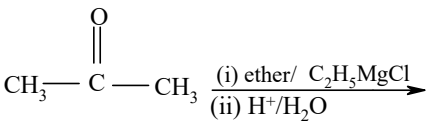
11. Explain with suitable examples: ($2\frac{1}{2}$)

(a) Both chlorobenzene and chloroethene do not undergo substitution reactions under ordinary conditions with NaOH.

(b) Carbonyl group of benzaldehyde is less reactive towards nucleophilic addition reactions than the carbonyl group of ethanal. ($2\frac{1}{2}$)

12. Write the product (s) and mechanism for the following reactions: (5)

(a) 

(b) 

13. How would you carry out following conversions? (5)

(i) Ethene to oxirane

(ii) Benzyl magnesium chloride to 3-phenylpropanol

(iii) Propene to glycerol

(iv) Benzaldehyde to 3-phenylpropenoic acid

(v) Ethanol to trichloromethane

14. (a) How would you differentiate between different classes of alcohols? ($2\frac{1}{2}$)

(b) Give two reduction methods which can convert a carbonyl compound to an alkane. $(2\frac{1}{2})$

15. What is decarboxylation? Which type of carboxylic acids easily undergo this reaction? (5)

16. (a) Explain zwitter ionic nature of amino acids. (2)

(b) Explain any two methods of synthesis, 1,2-benzenedicarboxylic acid starting from different reactants. Write the reactions involved. (3)

17. Explain the following reactions:

(i) Rosenmund reduction (2)

(ii) Bouveault-Blanc reduction. $\left(1\frac{1}{2}\right)$

(iii) Transesterification $\left(1\frac{1}{2}\right)$

18. Write the products formed by reduction of nitrobenzene with the following reagents: (5)

(i) i) Fe, HCl ii) NaOH

(ii) H_2,Ni at 298 K under pressure

(iii) As_2O_3, NaOH

(iv) Zn, NaOH (8 equivalent)

(v) Zn, NaOH (10 equivalent)

19. (a) What is Curtius rearrangement? Write the steps involved in it. (3)

(b) Illustrate Schiemann reaction with a suitable example. (2)

20. Write the structures of four nucleotides of DNA and name them. Also indicate bases and the sugar moieties present in these structures. (5)